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Challenges of Adaptation to Climate Change by Farmers Anambra State, Nigeria

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ABSTRACT
The study analysed the challenges farmers face in adapting to climate change in Anambra State, Nigeria. The study adopted the multistage sampling technique in selecting a cross section of two hundred and forty farmers. Cross-sectional data collected with the aid of a structured questionnaire was collected was analysed using descriptive statistics. The result revealed that that the average farm size, years spent in school, and age of the farmers was 0.85 ha, 11.35years and 57.82 years respectively. The major adaptation measures of farmers to climate change were mixed cropping (100%), crop rotation (86.7%), applications of fertilizers (82.1%), use of sand bags (83.3%). There are fifteen major challenges to agricultural adaptation to climate change. The most common constraints include lack of finance, inadequate information and absence of early warning systems, and lack of capacity of extension service to build the resilience of farmers on climate change. The study suggests that farmers' access to credit should be increased to enhance their ability to respond to climate change.

Keywords: Agriculture; Anambra State; Nigeria; climate change; adaptation; challenges

INTRODUCTION
Climate change threatens Nigeria's sustainable development and affects agriculture negatively in the country [1,2,3]. Nigeria contributes marginally to global warming and climate change, yet the impact of climate change is felt more in the country when compared to other nations in the world. The country's low adaptive capacity makes it more vulnerable to climate change. Agriculture in this country is highly vulnerable to the impacts of climate change because it is largely rain-fed and climate dependent [1,4,5]. Empirical evidence abound concerning the negative impact of climate change on Nigeria's agriculture particularly in southeast Nigeria where agriculture is the major livelihood activity [1,2,3,6,7,8,9,10,11,12,13,14]. Adaptation is one of the responses to climate change in developing countries like Nigeria.

Adaptation is very important in the achievement of farmers' food and livelihood security goals in the face of climate change, growing pressure on arable land and volatility of markets [15, 16]. Farmers can reduce the potential damage of these changes by choosing tactical farming practices which must be sustainable. Adopting farming practices which use environmentally friendly inputs, ensures social inclusiveness, and pursues economic well-being of farmers is important in building resilience to climate change and achieving food security in Nigeria. In Nigeria, particularly in Anambra State, where majority of the farmers are poor and are challenged with resource constraints, adopting practices that help build farmers resilience, becomes difficult. It then becomes imperative to study the challenges facing

farmers in Anambra State to adapt to climate change.

METHODOLOGY

This study was conducted in Anambra State. Anambra shares boundaries with Delta State to the west, Imo State to the south, Kogi State to the north, Enugu State to the northeast and east, and Abia State to the east. The land area of Anambra State is 4844 square Km with a population of 4,182,032 persons [17] with many subsisting in farming. Anambra State is located in southeast Nigeria and has characteristics of the rainforest belt of Nigeria. The rainforest zone of Nigeria is a belt of tall trees with dense undergrowth of shorter species dominated by climbing plants. The State usually experiences prolonged rainy season. The annual rainfall is usually above 1,800mm, relative humidity is above 80% during the rainy season, and mean annual temperature of 27^{0}C.

Anambra State has four agricultural zones (Aguata, Awka, Anambra, and Onitsha agricultural zones) and twenty one Local Government Areas (LGAs). Three LGAs were randomly selected from each of the four agricultural zones. In each of the selected LGAs, four communities were randomly selected. Five farmers were randomly selected in each of the selected communities from the list of farmers in such communities collected from agricultural extension agents working in the communities. This brought the number of respondents for the survey of the study two hundred and forty. Questionnaire was the main instrument for data collection. Data collected was analysed using descriptive statistics. The challenges to climate change adaptation were identified by listing commonly cited constraints and asking respondents to rate them on a five point Likert-type scale ranging from one being "Not important" to five being "Critical". 1 = Not important; 2 = Low; 3 = Modest; 4 = High; 5 = Critical. The mean values close to five indicate considerable constraints. A mean of 3.00 was used as cut-off point to determine how considerable the constraints are. Any constraint having a mean value of ≥ 3.00 was considered as a major constraint while those with mean value of < 3.00 were considered as a minor constraint. Thus, a 5-point graphic rating scale of 1, 2, 3, 4 and 5 add up to 15, which gives 3.00 as mean, when divided by 5.

RESULTS AND DISCUSSION

Socioeconomic Characteristics of the Farmers

Age structures of farmers are presented in Table 1. As shown in Table 1, a simple majority (41.67%) of the farmers fall within the age bracket of 50 - 60 years. About 38.33% of the farmers were above 60 years and constitute the elderly while those who fall within the age of 40- 50 years were 15.0%. Average age of the farmers was 57.82 years. This implies that the farmers are mainly of the middle age indicating that the middle age farmers. In other words, majority of them were between 40 to 60 years. The young age bracket (farmers of 40 years and below) constituted only 5.00% which is an indication of declining involvement of youth in agriculture.

Table 1 shows that majority (55.00%) of the farmers were females. This implies that the farmers are more of females. Thus, female headed households are engaging in agriculture more than male headed households. In the study area, females are involved in farming more than males who engage more in businesses. The level of education of farmers is indicated in Table 1. Almost all the farmers (88.33%) received formal education. The mean years spent in

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school by farmers 11.35 years. Following this result, farmers could be said to be literates. This result is in line with the findings of Onyeneke [18] who found the literacy level of rice farmers in Imo State to be approximately 95.00%. This implies that adoption of practices that will reduce the negative impacts of climate change will be favoured as education affects adoption positively. Table 1 shows that the majority (68.33%) of the farmers had farm sizes of 1-2 ha, 21.67% had farm sizes of less than 1 ha while the remaining 10.00% had 2-3 ha of farm land. The mean farm size of the farmers was 0.85 ha. This implies that the farmers are mainly smallholder farmers. This small landholding is not really favourable for adaptation to climate change

Table 1: Socio-economic characteristics of the farmers

Variable	Frequency	Percentage
Age (Years)		
Less than 40	12	5.00
41-50	36	15.00
51-60	100	41.67
Above 61	92	38.33
Total	**240**	**100.00**
Gender		
Female	132	55.00
Male	108	45.00
Total	**240**	**100.00**
Educational Level (Number of years spent in school)		
No Formal Education (0)	28	11.67
Primary Education (1-6)	40	16.67
Secondary Education (7-12)	88	36.67
Tertiary Education (12-18)	84	35.00
Total	**240**	**100.00**
Farm size (Ha)		
Less than 1	164	68.33
1 - 2	52	21.67
2.01 - 3	24	10.00
Total	**240**	**100.00**

Average age of the farmers = 57.82 years; Average number of years spent in school = 11.35years; Average farm size = 0.85 ha; Source: Field Survey, 2015

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Table 2: Adaptation measures of the farmers to climate change in Southeast Nigeria

Adaptation measures	Frequency	Percentage
Mulching	141	58.8
Use of cover crop	142	39.2
Mixed cropping	240	100
Crop rotation	208	86.7
Shifting cultivation	80	33.3
Flexibility in planting dates	206	85.8
Opening ditches	89	37.1
Building contours/sand bags	200	83.3
Use of fertilizers	197	82.1
Irrigation	58	24.2
Mixed farming	157	65.4
Engaged in non-farm act	140	58.3

*Multiple responses were recorded.
Source: Field Survey Data, 2015

Table 3: Challenges of climate change adaptation by farmers in Anambra State

Challenges of adaptation to climate change	Mean	Decision
Land fragmentation	3.23	Major constraint
Inadequate information	3.31	Major constraint
Poor access to credit facilities	3.51	Major constraint
High cost of irrigation facilities	2.01	Major constraint
High cost of fertilizers and other inputs	3.16	Major constraint
Lack of finance	4.33	Major constraint
Inadequate knowledge of how to cope or build resilience	3.65	Major constraint
High cost of improved varieties	3.89	Major constraint
Scarcity of farm labour	3.69	Major constraint
Lack of access to weather forecast technologies	3.68	Major constraint
Government non-responsiveness to climate risk management	3.47	Major constraint
Inadequate storage facilities	3.61	Major constraint
Inadequate processing facilities	3.97	Major constraint
Poor agricultural extension service delivery	1.74	Minor constraint
Lack of capacity of extension service to build resilience of farmers on climate change	4.18	Major constraint
Inadequate information and absence of early warning systems	4.11	Major constraint

Source: Field survey, 2015

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Local Adaptation Practices to Climate Change

Table 2 shows the local practices used by food crops farmers in Anambra State to respond to the effects of climate change on crop production. All the farmers (100%) adopted mixed cropping. Other major climate change response measures include crop rotation (86.7%), adjusting planting dates (85.8%), contour planting (83.3%), application of both organic/inorganic fertilizers (82.1%), mixed farming (65.4%), cover cropping (59.2%), mulching (58.8%) and diversifying to non-agricultural activities (58.3%). Other adaptation measures include opening of ditches, shifting cultivation and irrigation (manual). It was quite ironical to observe that such farming system as shifting cultivation which allows fallow for some years to replenish soil nutrients through decay of organic matters from natural vegetation as well as protect soil from erosion [19,20], was not much adopted. This was due to pressure on land which has adversely affected the resource base due to continuous cropping, making the land fragile and prone to erosion menace. This could explain the reason for high use of fertilizer (82.1%) by farmers as an alternative to improve soil nutrient, in spite of the fact that it is not environmental friendly and contributes to climate change. Generally, farmers in the study area hardly practiced irrigation due to high cost of the facilities involved and the dependence on rainfed agriculture as they are in the rain-forest zone with assumed high rainfall.

The few farmers that practice during the dry season made use of sprinklers (cans) and buckets to draw water from bore-holes, rivers or tanks etc. Similarly, farmers preferred to build contours (ridges) or used sandbags to block water from entering their farms instead of opening ditches or ponds to harvest water (control erosion), because they wanted to conserve the limited arable land. However, some of the major adaptation measures by the farmers such as mixed cropping which aids farmers resilience to crop failure due to extremes of weather variability, crop rotation to avoid incidence of pests/diseases, flexibility in planting dates due to unpredictable onset of rainfall, use of contours/sand bags to reduce erosion menace, application of fertilizers to improve soil fertility, mixed farming and diversifying to non-farm activities to argument family income in case of crop failure as well as mulching/use of cover crops to control erosion are in consistent with findings on similar research [1,2,3,6,7,14].

Challenges of Adaptation to Climate Change

The analysis of challenges to adaptation to climate change in Anambra presented in Table 3 shows that there are fifteen major constraints to adaptation. These are land fragmentation, inadequate information, lack of finance, poor access to credit facilities, high cost of fertilizers and other inputs, inadequate knowledge of how to cope or build resilience, high cost of improved varieties, scarcity of farm labour, lack of access to weather forecast technologies, and government non-responsiveness to climate risk management (Table 3). Others include inadequate storage facilities, inadequate processing facilities, lack of capacity of extension service to build resilience of farmers on climate change, inadequate information and absence of early warning system. Most of these constraints are associated with insufficient information, lack of capacity building, weak institutional structure, and poverty. For instance, insufficient information on appropriate adaptation practices/measures and poor extension contact and supervision could be

due inadequate research on climate change and agriculture-interactions in the country. Lack of finance is associated with poverty inherent in farming communities of Anambra State and it hinders farmers from getting the required technologies that enhance resiliency and reduces vulnerability.

CONCLUSION

There are fifteen major challenges to agricultural adaptation to climate change. The first three major constraints include lack of finance, inadequate information and absence of early warning systems, and lack of capacity of extension service to build resilience of farmers on climate change. In terms of the effect of this work on policy change of the government, it is suggested that farmers' access to credit should be increased to enhance their ability to respond to climate change. Government should also ensure that agricultural extension services reach the farmers in rural areas, particularly information and technologies that will help them adapt to climate. Also, in order to enhance farmers' resilience, there is need for capacity building for extension agents to assist them improve adaptation. Government should build an early warning system. The private sector/entrepreneurs should establish processing and storage facilities in the area to handle post-harvest losses that may arise due to climate change.

REFERENCES

[1] [1] Onyeneke R.U. (2010). Climate Change and Crop Farmers' Adaptation Measures in the Southeast Rainforest Zone of Nigeria. M.Sc. thesis, Department of Agricultural Economics, Extension and Rural Development, Imo State University, Owerri.

[2] [2] Nwajiuba, C. and R., Onyeneke (2010). Economic Effects of Climate on the Agriculture of sub-Saharan Africa: Lessons from Nigeria. Proceedings of the 10th Global Conference on Business and Economics, St. Hugh's College, Oxford University, June 28 – 29, 2010.

[3] [3] Onyeneke, R.U. and Madukwe, D.K. (2010). Adaptation Measures by Crop Farmers in the Southeast Rainforest of Nigeria to Climate Change. *Science World Journal,* 5 (1): 32-34.

[4] [4] Gbetibouo, G. A. (2009). Understanding Farmers' Perception and Adaptations to Climate Change and Variability: The Case of the Limpopo Basin, South Africa. International Food Policy Research Institute (IFPRI) Discussion Paper 00849, February 2009. Environment and Production Technology Division, IFPRI

[5] [5] Building Nigeria's Response to Climate Change (BNRCC) (2011). National Adaptation Strategy and Plan of Action on Climate Change for Nigeria (NASPA-CCN) prepared for the Federal Ministry of Environment Special Climate Change Unit, prepared by the Building Nigeria's Response to Climate Change (BNRCC) Project of the Nigerian Environmental Study/Action Team, Ibadan, Nigeria

[6] [6] Onyeneke R.U.; Mmagu C.J. and Aligbe J.O. (2017). Crop Farmers' Understanding of Climate Change and Adaptation Practices in southeast Nigeria. *World Review of Science, Technology and Sustainable Development. In Press*

[7] [7] Onyeneke, R.U.; C.O., Igberi; C.O. Uwadoka and J.O., Aligbe (2017). Status of climate-smart agriculture in southeast Nigeria. *GeoJournal* (2017). Forthcoming. doi:10.1007/s10708-017-9773-z

[8] [8] Onyeneke, R.U. (2016). Effects and Coping Measures of the 2012 Flood among Farming Households in Oguta Local Government Area of Imo State, Nigeria. *Nigerian Journal of*

Agriculture, Food and Environment, 12 (3): 225 – 229.

[9] [9] Onyeneke, R.U. (2016). Effects of Livelihood Strategies on Sustainable Land Management Practices among Arable Crop Farmers in Imo State, Nigeria. Nigeria. *Nigerian Journal of Agriculture, Food and Environment,* 12 (3): 230 – 235.

[10] [10] Onyeneke R.U.; C.U., Nwajiuba and C.S., Nwosu (2015). Determinants of Fuelwood Consumption among Farming Households in Imo State, Nigeria. *Journal of Environment Protection and Sustainable Development*, 1 (2): 54-58

[11] [11] Onyeneke R.U.; Nwosu C.S.; Nwajiuba C.U.; Okoye V.K and Mmagu C.J (2014). Comparative Analysis of Adaptive Capacity and Autonomous Adaptation Practices to Climate Change by Farming Households in Nnewi South Local Government Area, Anambra State, Nigeria. Proceedings of the 14th Annual National Conference of the Nigerian Association of Agricultural Economists, Federal University of Technology, Akure, 24th – 27th February, 2014.

[12] [12] Onyeneke, R.U. (2013). Micro-level Analysis of Determinants of Crop Farmers' Adaptation Intensity to Environmental Degradation in Orlu Agricultural Zone, Imo state, Nigeria. *Journal of Agriculture and Food Sciences*, 11 (2): 1 – 14.

[13] [13] Nwajiuba C.U.; R.U., Onyeneke, and A.A., Yakubu (2011). Climate Change Adaptation Strategy Technical Report for Nigeria: Agriculture Sector. A Compendium of Studies Commissioned and Published by Building Nigeria's Response to Climate Change (BNRCC) Project Coordinated by the Nigerian Environmental Study/Action Team (NEST) 1 Oluokun Street, Off Awolowo Avenue, Bodija UI-P.O Box 22025 Ibadan, Oyo State, Nigeria

[14] [14] Onyeneke, R. and C. Nwajiuba (2010). Socio-economic Effects of Crop Farmers in Adaptation Measures to Climate Change in the Southeastern Rainforest Zone of Nigeria. *Paper presented at the 11th Annual National Conference of the Nigerian Association of Agricultural Economists,* Federal University of Technology, Minna, 30th November– 3rd December, 2010.

[15] [15] Kandlinkar, M. and J., Risbey. (2000). Agricultural Impacts of Climate Change: If Adaptation is the Answer, What is the Question? *Climatic Change,* 45: 529-539.

[16] [16] Deressa, T.; R.M., Hassan; T., Alemu; M., Yesuf and C., Ringler (2008). Analyzing the Determinants of Farmers' Choice of Adaptation Methods and Perceptions of Climate Change in the Nile Basin of Ethiopia. *International Food Policy Research Institute (IFPRI) Discussion Paper No. 00798*. Environment and Production Technology Division, IFPRI, Washington D.C.

[17] [17] National Population Commission (2006). Provisional of State and Local Government Totals of the 2006 Population Census of the Federal Republic of Nigeria.

[18] [18] Onyeneke R.U. (2017). Determinants of Adoption of Improved Technologies in Rice Production in Imo State, Nigeria. *African Journal of Agricultural Research*, 12 (11): 888 – 896.

[19] [19] Binswanger, H. and Mcentire, J. (1987). Behavioural and Material Determinants of Production Relations in Land Abundant Tropical Africa. *Journal of Economic Development and Cultural Changes*, 1 (36): 73-99.

[20] [20] International Institute for Tropical Agriculture (IITA) (1992). Sustainable Food Production and Sub-Saharan Africa. IITA, Ibadan.